

## WHAT IS CLAIMED IS:

1. A gas turbine engine combustor can assembly comprising:

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a combustor can downstream of a pre-mixer;

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said pre-mixer having a pre-mixer upstream end, a pre-mixer downstream end and a pre-mixer flowpath therebetween, a plurality of circumferentially spaced apart swirling vanes disposed across said pre-mixer flowpath between said upstream and downstream ends, and a primary fuel injection means for injecting fuel into said pre-mixer flowpath;

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said combustor can having a combustion chamber surrounded by an annular combustor liner disposed in supply flow communication with said pre-mixer;

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an annular trapped dual vortex cavity located at said upstream end of said combustor liner and defined between an annular aft wall, an annular forward wall, and a circular radially outer wall formed therebetween;

a cavity opening at a radially inner end of said cavity spaced apart from said radially outer wall and extending between said aft wall and said forward wall;

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air injection first holes in said forward wall and air injection second holes in said aft wall, said air injection first and second holes spaced radially apart; and

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fuel injection holes in at least one of said forward and aft walls.

2. A combustor can assembly as claimed in claim 1, further comprising angled film cooling apertures disposed through said aft wall, said forward wall, said and outer wall.

3. A combustor can assembly as claimed in claim 2,  
further comprising said film cooling apertures  
through said aft walls are angled radially outwardly,  
said film cooling apertures through said forward  
5 walls are angled radially inwardly in a downstream  
direction, and said film cooling apertures through  
said outer wall are angled axially forwardly.

4. A combustor can assembly as claimed in claim 2,  
10 further comprising said film cooling apertures  
through said aft walls are angled radially inwardly,  
said film cooling apertures through said forward  
walls are angled radially outwardly in a downstream  
direction, and said film cooling apertures through  
15 said outer wall are angled axially aftwardly.

5. A combustor can assembly as claimed in claim 2,  
wherein each of said fuel injection holes is  
surrounded by a plurality of said air injection  
20 second holes and said air injection first holes are  
singularly arranged in a circumferential row.

6. A combustor can assembly as claimed in claim 5,  
further comprising angled film cooling apertures  
25 disposed through said aft wall, said forward wall,  
said and outer wall.

7. A combustor can assembly as claimed in claim 6,  
further comprising said film cooling apertures  
30 through said aft walls are angled radially outwardly,  
said film cooling apertures through said forward  
walls are angled radially inwardly in a downstream  
direction, and said film cooling apertures through  
said outer wall are angled axially forwardly.

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8. A combustor can assembly as claimed in claim 6,  
further comprising said film cooling apertures  
through said aft walls are angled radially inwardly,  
said film cooling apertures through said forward  
walls are angled radially outwardly in a downstream  
direction, and said film cooling apertures through  
said outer wall are angled axially aftwardly.

9. A combustor can assembly as claimed in claim 1,  
wherein said primary fuel injection means includes  
fuel cavities within said swirling vanes, fuel  
injection holes extending through trailing edges of  
said swirling vanes from the fuel cavities to said  
pre-mixer flowpath.

15 10. A combustor can assembly as claimed in claim 9,  
further comprising angled film cooling apertures  
disposed through said aft wall, said forward wall,  
said and outer wall.

20 11. A combustor can assembly as claimed in claim 10,  
further comprising said film cooling apertures  
through said aft walls are angled radially outwardly,  
said film cooling apertures through said forward  
walls are angled radially inwardly in a downstream  
direction, and said film cooling apertures through  
said outer wall are angled axially forwardly.

30 12. A combustor can assembly as claimed in claim 10,  
further comprising said film cooling apertures  
through said aft walls are angled radially inwardly,  
said film cooling apertures through said forward  
walls are angled radially outwardly in a downstream  
direction, and said film cooling apertures through  
said outer wall are angled axially aftwardly.

13. A combustor can assembly as claimed in claim 10,  
wherein each of said fuel injection holes is  
surrounded by a plurality of said air injection  
second holes and said air injection first holes are  
5 singularly arranged in a circumferential row.

14. A combustor can assembly as claimed in claim 13,  
further comprising angled film cooling apertures  
disposed through said aft wall, said forward wall,  
10 said and outer wall.

15. A combustor can assembly as claimed in claim 14,  
further comprising said film cooling apertures  
through said aft walls are angled radially outwardly,  
said film cooling apertures through said forward  
walls are angled radially inwardly in a downstream  
15 direction, and said film cooling apertures through  
said outer wall are angled axially forwardly.

20 16. A combustor can assembly as claimed in claim 14,  
further comprising said film cooling apertures  
through said aft walls are angled radially inwardly,  
said film cooling apertures through said forward  
walls are angled radially outwardly in a downstream  
25 direction, and said film cooling apertures through  
said outer wall are angled axially aftwardly.

17. A combustor can assembly as claimed in claim 1,  
further comprising:  
30 a reverse flow combustor flowpath including, in  
downstream serial flow relationship, an aft to  
forward portion between an outer flow sleeve and said  
annular combustor liner, a 180 degree bend forward of  
said vortex cavity, and said pre-mixer flowpath at a  
35 downstream end of said combustor flowpath;

said swirling vanes 32 disposed across said pre-mixer flowpath defined between an outer flow sleeve and an inner flow sleeve.

5       18. A combustor can assembly as claimed in claim 17, further comprising:

      said film cooling apertures through said aft walls are angled radially inwardly,

10      said film cooling apertures through said forward walls are angled radially outwardly in a downstream direction,

      said film cooling apertures through said outer wall are angled axially aftwardly,

15      said fuel injection holes and said air injection second holes are disposed through said forward wall, and

      said air injection first holes are disposed through said aft wall.

20      19. A combustor can assembly as claimed in claim 18, wherein said primary fuel injection means includes fuel cavities within said swirling vanes, fuel injection holes extending through trailing edges of said swirling vanes from the fuel cavities to said pre-mixer flowpath.

25      20. A combustor can assembly as claimed in claim 18, further comprising angled film cooling apertures disposed through said aft wall, said forward wall, said and outer wall.

30      21. A combustor can assembly as claimed in claim 18, wherein each of said fuel injection holes is surrounded by a plurality of said air injection second holes and said air injection first holes are

singularly arranged in a circumferential row.

22. A combustor can assembly as claimed in claim 2,  
further comprising a second stage pre-mixing  
5 convoluted mixer located between said pre-mixer and  
said vortex cavity and including circumferentially  
alternating lobes extending radially inwardly into  
said pre-mixer flowpath.

10 23. A combustor can assembly as claimed in claim 22,  
further comprising angled film cooling apertures  
disposed through said aft wall, said forward wall,  
said and outer wall.

15 24. A combustor can assembly as claimed in claim 23,  
further comprising:

    said film cooling apertures through said aft  
    walls are angled radially outwardly,  
    said film cooling apertures through said forward  
20 walls are angled radially inwardly in a downstream  
    direction,

    said film cooling apertures through said outer  
    wall are angled axially forwardly,

    said fuel injection holes and said air injection  
25 second holes are disposed through said aft wall, and  
    said air injection first holes are disposed  
    through said forward wall.

25. A combustor can assembly as claimed in claim 24,  
30 wherein each of said fuel injection holes is  
surrounded by a plurality of said air injection  
second holes and said air injection first holes are  
singularly arranged in a circumferential row.